GEY 436/636 Quaternary Paleoecology
Spring 2016

Tuesday-Thursday 2:30-3:45 pm LFG 103

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Office hours: Tuesday & Thursday 3:45 – 5:30 pm, Weds 2:00-3:30, or by appointment

Book: *Ice Age Mammals of North America* by Ian M. Lange, 2002

Other reading assignments will be available on webcampus or will be handed out in class.

Field trips:

1. **Saturday February 20**: Field trip to drive up the Kyle Canyon alluvial fan and into the Spring Mountains. Focus will be on plant communities and ecology of the Mojave Desert**.** On the way back we will visit a spring mound near Corn Creek and/or visit Tule Springs Fossil Beds.

2. Weekend field trip: **Friday through Sunday, March 11-13,** to do the following:
   - visit the La Brea Tar Pits (Page Museum) in Los Angeles
   - visit two other museums in Southern California
   - examine Pleistocene lake basins (Manix and Tecopa basins), Pleistocene fossil tracks, and a tiny museum with Pleistocene proboscidean fossils in the Mohave Desert (in Shoshone, CA)

Course Objectives

After completing this course, you will:

1. Be able to describe the history and evolution of ideas about Quaternary climates and climate cycles, including the contributions of Louis Agassiz and Milutin Milankovitch.

2. Be able to describe the beginning and ending boundaries of the Quaternary Period and the Pleistocene and Holocene Epochs, and the features that define these boundaries.

3. Be able to read a technical journal article concerning Quaternary paleoecology and understand what the researchers did, why they chose to do it that way, and what they concluded.

4. Be able to describe the nature of the paleoclimatological and paleoecological information recoverable from packrat middens, pollen analysis, and tree ring analysis.

5. Be able to explain the basic principles of ecology, including food chains, food webs, ecological pyramids, ecological succession, and island biogeography.

6. Be able to explain the concept of "sky islands," using mountain ranges in the Basin-and-Range Province as examples.

7. Be able to describe the most common Mojave Desert plant communities, including some representative species of plants and animals of each, and the elevations at which each community occurs.

8. Be able to describe the major techniques for dating Quaternary deposits, and the strengths and limitations of each.

9. Be able to describe the difference between calendar years and radiocarbon years, and Be able to explain why these two types of years exist.

10. Be able to describe the main characteristics of North American Pleistocene terrestrial mammalian communities, which species were the most common herbivores, and which were the most common carnivores; be able to describe how these communities changed over time with immigrants from South America (Great American Biotic Interchange) and Asia.

11. Be able to describe the Pleistocene megafauna extinction event in North America and the current views and controversies about the causes of this extinction event.

12. Be able to describe a research program that could be used to test hypotheses concerning the extinction of the Pleistocene megafauna.

13. Be able to describe the characteristics of plants (and the fruits of such plants) that employ megafaunal seed dispersal mechanisms, and name at least one species of Mojave Desert plant that has probably lost its primary seed dispersal partner.

14. Be able to describe in some detail the Quaternary history of the southwestern U.S., including key localities that have contributed to our understanding of this history; be able to describe the key characteristics of the Pleistocene deposits of the La Brea tar pits and the Tule Springs Fossil Beds.

15. Be able to list (by common name and scientific name) the proboscideans that lived in North America during the Pleistocene, and describe how these species are different from one another in terms of morphology and autecology.

16. Be skilled at interpreting mammoth teeth (able to distinguish maxillary teeth from mandibular teeth; right teeth from left teeth; M6 teeth from M5 teeth, etc.) and be

able to construct and interpret an age profile of a mammoth population from an assemblage of teeth.

17. Be able to design a research program involving the use of stable isotopes of carbon, oxygen, and nitrogen to address questions concerning aspects of the paleoecology of a single animal and a community.

18. Be able to explain the essential features of the science and policy debate associated with "resurrection biology" (bringing extinct species back to life) and "rewilding" (repopulating some areas with resurrected Pleistocene species or closely related "surrogate" species).

19. Have a deeper interest in—and enthusiasm for—Quaternary paleoecology than you had at the beginning of the course.

Grading*

GEOL 436		GEOL 636	
Online quizzes (on reading assignments)	10%	Online quizzes (on reading assignments)	10%
Exam #1	25%	Exam #1	25%
Exam #2	30%	Exam #2	30%
Final Exam	35%	Final Exam	30%
		Case study presentation(s)	5%

*Slightly different versions of the exams may be written for GEOL 436 students and GEOL 636 students.

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Lecture/Discussion Schedule
Subject to adjustments during the semester

Week of		Reading
1/18	Introduction to the course/What is Quaternary paleoecology and why should we care about it?/Nomenclature/ NALMAS/$\delta^{18}O$ values and Marine Isotope Stages/ Post-Pleistocene subsidence & uplift/	● Lange p. 21-39, 45-48 ● Agassiz: *Études sur les Glaciers* (1840)
1/25	Nineteenth Century history of ideas about "the Ice Age"/Louis Agassiz/Relationship between geology, art, & literature in the 19th C./Paintings of Thomas Cole/Willey Disaster/ The banishment of 'purpose' (= 'final cause') from science/	● Nathaniel Hawthorne's *The Ambitious Guest* ● Lange p. 49-63
2/1	Milanković cycles/Past & future climate history/Precession-related lakes in Africa/Precession-related climate cycles in the Great Basin/Mojave Desert/Principles of ecology/	TBA
2/8	Deserts of N. Amer./Mojave Desert ecology/Geological, climatological, & biological history of the Mojave Desert/ Evolution of ecological systems/ MacArthur & Wilson model of island biogeography/sky islands/GABI/	● Rowland manuscript ● Robert May article
2/15	Introduction to the Pleistocene of Southern Nevada	● Rowland "Evolving Landscapes"
	Thursday Feb 18 Exam #1	
	Saturday February 20: Field trip up the Kyle Canyon fan to examine plant communities, including a stop at a spring mound at Corn Creek and/or Tule Springs Fossil Beds	
2/22	Politics, paleontology, & paleoclimatology of Tule Springs Fossil Beds/Comparison with La Brea Tar Pits	● Rowland "Desert Report" article ● Rowland & Bonde ● Springer et al. (PNAS)
2/29	Paleoecology of proboscideans Case study: Hyde Park mastodon Case study: Constructing an age profile of mammoths from the Gilcrease cauldron spring	● TBA
3/7	Proboscideans (continued)/La Brea Tar Pits paleontology	● TBA
	Friday-Saturday-Sunday March 11-13: Field trip to visit Southern California Museums and Pleistocene deposits in the Mojave Desert	
		Reading
3/14	Proboscideans concluded/Radiocarbon dating/Other dating techniques useful for Quaternary deposits	● Libby (1961)

3/21	----------**Spring Break**----------	
3/28	Dendroclimatology case study: Stockton (1975) tree-ring study of the history of drought in the Colorado River basin/ Case study: Shivwits plateau packrat midden study (radiocarbon dates, palynology, macrofloral analysis, paleoclimate)/	● TBA
4/4	[Cordilleran Section GSA Week]; no class on Tuesday April 5	

Thursday April 7 Exam #2

4/11	Miscellaneous cave studies/Gypsum Cave/Friesenhahn Cave/ Hall's Cave/Seed dispersal ecology and the question of lost dispersal partners	● Glowiak M.S. thesis ● TBA
4/25	Stable isotopes in Quaternary paleoecology Case study: reconstructing the life of Õtzi the Iceman	● Fox-Dobbs et al. (2006) ● TBA
5/2	The extinction of North America's Pleistocene megafauna/ Resurrection biology and rewilding	● Lange 181-198 ● Ripple & Van Valkenburg ● TBA

Final Exam Thursday May 12 3:10-5:10